



**National Aeronautics  
and Space Administration**

**Revised as of November 26, 1999  
NRA 99-OSS-05**

---

# **REVISED**

## **NASA Research Announcement**

### **Advanced Cross-Enterprise Technology Development for NASA Missions**

---

**Notices of Intent to Propose Due:  
Proposals Due:**

**Revised to: December 20, 1999  
Revised to: February 15, 2000**

**Advanced Cross-Enterprise Technology Development for NASA Missions**

REVISED  
NASA Research Announcement

NRA 99-OSS-05  
Issued: October 29, 1999  
Revised to: November 26, 1999

Proposals Due: December 23, 1999  
Revised to: February 15, 2000

Office of Space Science  
National Aeronautics and Space Administration  
Washington, DC 20546-0001

## **SUMMARY OF REVISIONS TO POSTED NRA 99-OSS-05**

### **Advanced Cross-Enterprise Technology Development for NASA Missions**

#### **Summary Cover Letter**

- On page 2, the first sentence of the second paragraph is revised to read “Revised Appendix A contains detailed descriptions of each advanced technology Thrust Area and the developments sought under this NRA.”
- On page 2, paragraph 4, the second sentence, “Roughly \$20M per year,...” is revised to read: “Roughly \$40M per year, for three years, is expected to be available to support this NRA, and it is expected that awards will be made in the range of \$100-700K per year.”
- On page 3, the second bullet on date of NRA issue is revised to November 26, 1999
- On page 3, the third bullet on summary information, the due date for Notice of Intent due date is revised to December 20, 1999.
- On page 3, the fifth bullet on summary information, the due date for the Submission of Proposal is revised to February 15, 2000.

#### **Appendix A**

The entire Appendix A has been revised.

#### **Appendix B**

No changes.

#### **Appendix C**

No changes.

## **Advanced Cross-Enterprise Technology Development for NASA Missions**

The Cross-Enterprise Technology Development Program (CETDP), located within the Advanced Technology and Mission Studies (AT&MS) Division of the Office of Space Science (OSS), is responsible for developing critical space technologies that enable innovative and less costly missions, and new mission opportunities through revolutionary, high-risk, high-payoff technology advances. The CETDP serves four primary customers: the Earth Science Enterprise (ESE), the Human Exploration and Development of Space (HEDS) Enterprise, the Space Science Enterprise (SSE), and the Office of the Chief Technologist's (OCT) Strategic Technology Areas. Cross-Enterprise technology developments are long range, strategic technologies that have broad potential to span the needs of more than one Enterprise. Emphasis is placed on basic research into physical principles, formulation of applications concepts, and component-level development. Further information about the CETDP and other complementary technology programs may be found in the OSS/ATMS home page at <<http://spacescience.nasa.gov/osstech/>> and links therefrom.

Appendix A contains detailed descriptions of each advanced technology Thrust Area and the developments sought under this NRA. Appendix B provides the standard NASA guidance for responding to NRA's, while Appendix C provides amendatory guidance to Appendix B for the detailed format and submission requirements for proposals to be submitted to this NRA. Interested proposers should carefully read both Appendix C in its entirety as well as the advanced technology thrusts of interest in Appendix A before writing their proposals; special attention is directed to the fact that electronic submissions of a Notice of Intent to propose and a combined Cover Page/Proposal Summary are now required.

OSS/AT&MS policy encourages participation in education and public outreach activities with the goal of contributing to the broad public understanding of science and technology. Additional information can be attained by selecting *Education and Public Outreach* from the menu on the OSS homepage at <<http://spacescience.nasa.gov/>>.

Proposals in response to this NRA may request periods of performance for up to three years. Roughly \$40M per year, for three years, is expected to be available to support this NRA, and it is expected that awards will be made in the range of \$100-700K per year. Recommendations for funding will be based on the evaluation of each proposal's technical merits, its relevance to the CETDP objectives as described in this NRA, and its requested budget. In all cases, the Government's obligation to make awards is contingent upon the availability of appropriated funds from which payment can be made and the receipt of proposals that NASA determines are acceptable for award under this NRA.

Participation in this program is open to all categories of foreign and domestic organizations, including NASA Centers and the Jet Propulsion Laboratory, educational institutions, industry, nonprofit institutions, and other Government agencies. Historically Black Colleges and Universities (HBCU's), other minority educational institutions, and small businesses and organizations owned and controlled by socially and economically disadvantaged individuals or women are particularly encouraged to apply.

The following summary information applies to this NRA:

- NASA identifier: NRA 99-OSS-05
- Date of NRA issue: November 26, 1999
- Notice of Intent (NOI) to propose:
  - Due date December 20, 1999
  - Address for electronic submission: <http://props.oss.hq.nasa.gov>  
(contact <[deb.tripp@hq.nasa.gov](mailto:deb.tripp@hq.nasa.gov)> for assistance)
- Address for electronic submission of proposal *Cover Page/Proposal Summary*:  
  
<http://props.oss.hq.nasa.gov>  
(contact [deb.tripp@hq.nasa.gov](mailto:deb.tripp@hq.nasa.gov) for assistance)
- Submission of Proposal:
  - Required number 15 copies *plus* signed original
  - Due date By close of business on February 15, 2000
  - Address for delivery by U.S. Postal Service, personal courier, or commercial service:  
Cross-Enterprise Technology Development  
Program  
Jorge Scientific Corporation  
Suite 700  
400 Virginia Avenue, SW  
Washington, DC 20024  
Tel: 202-554-2775
- Selecting Official: Director, Advanced Technology and Mission  
Studies Division

- Announcement of selection: About 4 months after proposal due date
- Initiation of funding: About 1 month after selection
- For General Programmatic and Policy information, please contact:

Dr. Melvin D. Montemerlo  
 Advanced Technology and Mission  
 Studies Division  
 Code SM  
 Office of Space Science  
 NASA Headquarters  
 Washington DC 20546  
 E-mail: [mmontemerlo@hq.nasa.gov](mailto:mmontemerlo@hq.nasa.gov)  
 Telephone: 202-358-4664

- For Technical Questions, please contact the Technical Points of Contact cited in Appendix A

Your interest in submitting a proposal in response to this NRA is appreciated.

Peter B. Ulrich  
 Director  
 Advanced Technology and Mission Studies Division  
 Office of Space Science

## TABLE OF CONTENTS

APPENDIX A:	Cross-Enterprise Technology Development Program Thrust Area Descriptions
A.1	Advanced Power and On-Board Propulsion
A.2	Breakthrough Sensor and Instrument Component Technology
A.3	Distributed Spacecraft
A.4	High Rate Data Delivery
A.5	Thinking Space Systems
A.6	Micro/Nano Sciencecraft
A.7	Surface Systems
A.8	Ultra-Lightweight Structures and Space Observatories
A.9	Next Generation Infrastructure Systems
A.10	Atmospheric Systems and In-Space Operations
A.11	Education/Public Outreach Proposals
APPENDIX B:	General Instructions for Responding to NASA Research Announcements
APPENDIX C:	Specific Guidance for Proposal Preparations and Submission

**CROSS-ENTERPRISE TECHNOLOGY DEVELOPMENT PROGRAM  
THRUST AREA DESCRIPTIONS**

**A.1 Advanced Power and On-Board Propulsion**

This Thrust Area solicits proposals for advanced power generation, energy storage, power management and control concepts, and on-board propulsion techniques that dramatically reduce spacecraft bus mass, volume, and cost while maintaining or improving spacecraft performance.

Of specific interest in this Thrust Area is the development of:

- Solar photovoltaic cells and arrays of very high efficiency ( $>30\%$ ) that are tolerant of the space environment, and ultra-light thin film solar photovoltaic cells and arrays with greater than 20% efficiency cells;
- Advanced, long life batteries with significant reductions in mass, volume, and cost, and with a wider tolerance to space operating temperatures;
- Flywheel energy storage system components with improvements that enhance their application to smaller spacecraft and their integration with spacecraft attitude control functions;
- Improved Hall propulsion systems that provide increased efficiency, increased specific impulse, increased system robustness, reduced mass, and reduced system complexity;
- Advanced high specific impulse, high efficiency electric propulsion for missions requiring fast payload deliveries using small, power-limited spacecraft;
- New electromagnetic concepts aimed at dramatically increasing thrust for primary propulsion applications in Earth orbit;
- Micro propulsion concepts that provide specific impulse of over 500 seconds for fleets of miniature spacecraft; and
- Innovative chemical propulsion technologies for small spacecraft with a mass of less than 50 kilograms.

**A.2 Breakthrough Sensor and Instrument Component Technology**

This Thrust Area solicits proposals in breakthrough sensor and instrument component technology that is especially innovative in its design and implementation. Breakthroughs are sought in sensor performance and sensitivity, and magnitude reductions in mass, power, environmental constraints, and cost. Proposals should focus on basic physics and technology development rather than on building and testing specific flight instruments that meet specific flight requirements.



Of specific interest in this solicitation is the development of:

- Coolers and cryogenic technologies for a broad range of cooling requirements over a temperature range of 0.05K to 150 K, offering significant improvements in efficiency and performance. Specifically, cooling technologies that will offer continuous, vibrationless operation in a spacecraft environment are sought. Cryogenic systems and technologies are also needed that would enable the production, storage, transportation, and distribution of propellants in space and on other planets;
- Microwave and submillimeter technologies with breakthrough capabilities in the microwave, millimeter-wave, submillimeter-wave, and far infrared, including:
  - Quantum limited microwave amplifiers;
  - Quantum limited millimeter-wave and submillimeter-wave mixers (>1 THz) and submillimeter-wave local oscillators;
  - Sensitive and high spectral resolution coherent receiver arrays which operate in the microwave through far-IR wavelengths;
  - Active (Radar) subsystems, including true time delay elements, integrated phase array elements, and high power amplifiers; and
  - Faster mixers and quasi-optical components.
- Laser and Laser System Components offering significant improvements in efficiency and reliability, and significant reductions in instrument mass, power consumption, and complexity, including:
  - Improved (compact, high efficiency, long life, high reliability, narrow line width, tunable, high stability, room temperature) laser transmitters and receivers at all wavelengths;
  - New laser materials and sources;
  - New active and passive laser cooling technologies;
  - Improved tunable reference local oscillators;
  - Narrow-band laser filters;
  - High quantum efficiency laser detectors; and
  - Advanced laser detection electronics.
- Instrument optical and opto-mechanical components to provide large gains in the optical performance of remote and insitu optical instruments, including:
  - Micro/miniature mechanisms (shutters, adaptable surfaces, etc.) for miniaturization of complex optical instruments;
  - Uniform and stable miniaturized blackbody calibration sources;
  - Transmission and reflection grating, prism and beam-splitter technology; and
  - Lightweight, grazing incidence optics, and multi-layer coatings to extend their reflectivity to higher energies.
- In situ sensing technologies that focus on microchemical and microbiological systems. Biological sensors include in vivo sensors measuring electrolytes, enzymes, or proteins, aerosol detection, micro amino acid detectors, and microsystems measuring bacterial and viral constituents. The emphasis should be on developing miniaturized enabling components and systems that offer great reductions in mass, power and volume, and be able to operate in harsh (planetary and in vivo) environments;

- In situ sensors that directly sense a sample, and provide novel sample collection and detection methods, including:
  - Chemical sensors that perform an analysis in surface or subsurface samples, such as Raman spectrometers, total organic carbon analyzers, mini-mass spectrometers, and micro gas and liquid chromatography devices; and
  - Physical sensors including extremely sensitive seismic sensors; flow sensors that operate in two-phase environments; micro X-ray fluorescence and diffraction, and micro wind and humidity sensors.
- Photon detectors that provide both photon counting and energy resolving capabilities within the detector. Detectors capable of sensing from the near infrared to the ultraviolet are particularly sought. Development of these types of detectors into large format focal planes for space instruments is also desired;
- Photon detectors with breakthrough capabilities in spectral coverage, sensitivity, array size, spectroscopic capabilities, or their ability to operate effectively in harsh environments (uncooled, low power, extreme temperatures, etc.), including:
  - Large format, low power, highly integrated visible detectors;
  - LWIR and FIR infrared detectors with high sensitivity;
  - Uncooled thermal detector arrays emphasizing the SWIR through mid-IR; and
  - Sensitive X-ray, UV, visible, gamma-ray and IR detectors with both spatial and spectral sensing capability.
- Innovative particle and field sensors, including radiation monitors, neutral particle detectors, electric field sensors, magnetometers, plasma wave analyzers, and electrostatic measurement sensors; and charged particle velocity analyzers for the range 1 eV to 10 MeV, for arrays of sciencecraft;
- Innovative technologies for remote sensing imagers of neutral atoms, photons, and radio waves, including UV spectroscopy technologies for lightweight, low power applications; and
- Innovative sensor concepts based on development of novel applications of nanotechnology and quantum mechanics.

### **A.3 Distributed Spacecraft**

This Thrust Area solicits proposals addressing distributed spacecraft architectures, methodologies, and hardware components that enable a spatially distributed network of individual vehicles (not limited to a set of similar vehicles) to act collaboratively as a single collective unit that exhibits a common system wide capability.

Of specific interest in this solicitation is the development of:

- Formation control, unique actuators, sensors, and inter-satellite communication strategies and techniques to support precision station-keeping, stringent multiple spacecraft pointing and position requirements for separated space interferometers, tethered interferometers using multiple satellites, and other constellations/formations for Earth and Space environment observing;
- Techniques and methods for spacecraft formation characterization and management;
- Formation deployment, initialization, and reconfiguration strategies and methods; and
- Mission analysis and design tools, simulation tools, and test bed environments that support the development, verification, demonstration, and application of distributed spacecraft techniques, including techniques for the high fidelity modeling and simulation of the interaction of multiple, distributed spacecraft, the characterization of distributed spacecraft system impacts and trades associated with other spacecraft subsystems, coordinated science observations from multiple vantage points, and ground/flight operations concepts.

#### **A.4 High Rate Data Delivery**

This Thrust area solicits revolutionary technology development proposals to enable high performance, next-generation communication architectures for near-Earth and deep space missions whereas the data is distributed directly to the users. The advance architectures include communications within multi-spacecraft constellations as well. Emphasis is on new technologies that will provide dramatic improvements in component and/or system data throughput while significantly reducing spacecraft mass, size, or cost.

Of specific interest in this solicitation is the development of:

- Innovative concepts for achieving high accuracy (near diffraction limited), low cost and thermally stable optical telescopes, and precise optical beam pointing while suppressing the effects of host spacecraft platform vibrations (a typical beam-steering requirement is to achieve sub-microradian steering accuracy while covering multiple milliradians of overall steering range);
- Highly efficient optical signal modulation, coding, and detection that will approach or exceed 10 photons/bit communications sensitivities, and narrowband (sub-angstrom) optical filters with passband throughputs (>80%), that can be electronically tuned to compensate for Doppler shift;
- Inexpensive techniques for removing the effects of atmospheric turbulence or beam scintillation on optical uplink and downlink signals;
- Agile, multi-beam antenna technologies and systems that enable inter-orbital inter-satellite links, intra-constellation communications, and tracking of multiple mobile surface-based terminals;

- Revolutionary advances in microwave and millimeter wave amplifier and receiver technologies, to greatly enhance spacecraft capability and efficiency (>45%) for high rate data near-Earth and deep space backbone communications as well as intra-spacecraft and in-situ communications;
- Efficient, high data rate modulation, coding, and signal processing/switching technologies and components for enhanced data throughput;
- Advances in high-order information retrieval systems including class-type hierarchies for multiple data types that are capable of sharing and fusing disparate data among a distributed user community in a seamless fashion; and
- Reliable, small, integrated software and network modules and/or concepts that enable seamless interoperability among space and ground-based networks, and space-to-space networks and multi-spacecraft networks to enable space Internet architectures.

## A.5 Thinking Space Systems

This Thrust Area solicits proposals for adaptive, inquisitive, self-reliant, reliable, cooperative space systems that will operate in a changing and uncertain environment and accept high-level goals from ground operators and/or from astronauts. Such systems will also be able to conduct measurements or activities based on current or historical observations or inputs, recognize desired phenomenon and concentrate observations or activities accordingly, and monitor and maintain desired configurations for long periods of time without frequent communications with the ground. The thrust area is also concerned with analyzing, modeling, and understanding data collected on science missions.

Of specific interest in this solicitation is the development of:

- Science data understanding, modeling, and analysis tools and techniques that allow NASA to put its science data to the best possible use;
- Speech recognition and other advanced-capability user interfaces that allow astronauts or ground operators to interface with space systems using high-level goals in a mixed-initiative mode;
- Advanced on-board computing capability and artificial intelligence techniques and algorithms, including capabilities in machine learning, pattern recognition, neural networks, and probabilistic networks;
- Spacecraft fault detection, isolation, and recovery techniques and systems, including self-repairing systems and architectures and automated model-based reasoning;
- Knowledge-based software engineering for space systems;
- Algorithms, software, and systems for on-board spacecraft autonomy;
- Collaborative autonomous systems technology and distributed optimization and control; and
- Adaptive learning techniques and distributed, cooperative learning agents.

## **A.6 Micro/Nano Spacecraft**

This Thrust Area solicits proposals to advance technology in support of NASA's intent to reduce the size and mass of future spacecraft elements by orders of magnitude compared with today's state of the art. Such technology advances, based on the photolithographic techniques developed for microelectronics and the emerging field on nano-technology, will permit concomitant reductions to the size and mass of spacecraft or a significant increase in capability of current sized spacecraft.

Of specific interest in this solicitation is the development of:

- Micro-navigator system and associated sensors, particularly micro-gyroscopes having a total drift rate of 0.1 deg/hr or less, micro-accelerometers having  $10^{-9}$  g sensitivity and  $10^{-8}$  g precision and accuracy, and advanced micro-scale sun sensors and star trackers with integrated electronics;
- Multi-functional structures including micro-systems that integrate structure, thermal control, photovoltaics, and batteries with integrated battery state-of-charge management;
- Micro-scale fluid management for thermal, power, and propulsion systems.
- Ultra-high density, very low power, radiation-hard or radiation-tolerant electronic components and systems, including instrument and flight system computing components, sensor electronics and image processing components and subsystems, data handling and storage components, and power microelectronics; and
- Micro electro-mechanical systems (MEMS) techniques and components, including miniaturized instrument sensors, health-monitoring sensors and sensor systems, and low power and low mass communications components.

## **A.7 Surface Systems**

This Thrust Area solicits proposals of relevance to the lower cost, more efficient and more productive exploration of planetary and other body surfaces in the solar system, and the safe, fully self sufficient and self sustaining human presence on other planets or the moon. Examples include development of autonomous, low power processing systems that convert in situ resources into useable products for robotic and human missions and future commercial exploitation of space, development of self sustaining mobile systems that can survive many years in harsh surface environments with the use of safe energy sources, and development of systems for the global circumnavigation of planetary surfaces in a reasonable period of time.

Of specific interest in this solicitation is the development of:

- Capabilities for forming a robotic colony that works together to do important tasks, such as site selection, site preparation, and habitat-deployment, on planetary surfaces, as a precursor to human exploration missions (initial emphasis is on intelligent system software capabilities, using existing hardware if necessary, to conduct proof-of-principle experiments, which will be complemented in subsequent years with increased hardware development once initial principles have been evaluated);
- Systems which can repair/replace/reconfigure themselves (with minimal human intervention from the ground) to cope with unexpected events while maintaining accomplishment of functional goals;
- Studies, experiments, and software development aimed at understanding the limits and capabilities (e.g., survivability) of autonomous robots to perform difficult tasks, and the determination of critical tasks that robots cannot perform, thus making human presence essential;
- Robotic systems to enable surface sampling from aerial vehicles;
- Robotic systems which develop and couple in-situ generated propellants with new robotic vehicle designs whose mobility is based on these fuels, for both science and human exploration; and
- Subsurface and submersible vehicle concepts and designs for deep exploration of planetary subsurfaces and postulated ocean formations.

## **A.8 Ultra-Lightweight Structures and Space Observatories**

This Thrust Area solicits proposals for the development of large, ultra-lightweight structures and apertures (Earth and Space Science observatories, antennas, solar sails, sunshades, and inflatables), the development of advanced materials to enable these systems, and the mitigation of space environmental effects to extend their operational lifetime.

Of specific interest in this solicitation is the development of:

- Inflatable ballutes for aerocapture systems, including design concepts, high-temperature materials, computational aerothermodynamics, trajectory simulation, and hypersonic flowfield testing;
- Ultra-thin, high strength thin films with imbedded rip stops and reflective coatings for use in space, with operational lifetimes greater than 10 years;
- Novel techniques for the fabrication, seaming, and handling of large area membranes for inflatable structures, sunshields, solar sails, and planetary and stratospheric balloons;
- Ultra-lightweight large structural components such as deployable and/or inflatable rigidizable boom structures with high buckling strength (50-100 meters long);
- Large (> 25 meters) deployable and/or inflatable antennas for use in space based radio astronomy, microwave radiometry, radar, and communications;

- Concepts and components to enable large, ultra-lightweight (areal density  $< 5 \text{ kg/m}^2$ ), diffraction limited optical systems (e.g., reflective and transmissive Fresnel lens) for investigations in sub-millimeter/Far IR, IR, Visible, and UV spectral regions;
- Membrane optics technology for very large aperture ( $> 10$  meters) astronomical telescopes and Earth imaging systems;
- Concepts and components for active, adaptive wavefront control systems, including shape control of membrane mirrors, with correction to  $< 1$  wavelength;
- Lightweight shielding and other countermeasures to protect humans and spacecraft systems from harmful effects of space radiation, including predictive models and materials development;
- Carbon nanotube-based composite materials with substantially higher strength-to-weight ratios than state-of-the-art composites. Applications include structural elements and high-strength membranes; and
- Technologies for mitigating the effects of meteoroids on large membrane structures applicable to near-Earth, interplanetary, and deep-space missions.
- Methods for predicting and controlling contamination resulting from the deployment and outgassing of large inflatable structures, solar sails, and sunshields.
- Methods for predicting and preventing the accumulation of static electrical charge and dust on rovers and probes exploring planetary surfaces such as Mars.

## A.9 Next Generation Infrastructure Systems

This thrust area solicits proposals to research, develop, assess, validate and demonstrate capabilities which enable networked collaborative engineering and science amongst geographically distributed teams of engineers and scientists. These capabilities include processes, methods and collaborative tools which provide infrastructure for revolutionary advances in engineering and science. The solicited capabilities should provide solutions to synthesizing distributed engineering and science tools, processes, models, data, knowledge and expertise now distributed across NASA at its Centers, JPL, and its contractors.

Of specific interest in this solicitation is the development of:

- Significantly improved speed and/or accuracy of single discipline, deterministic, physics-based, and non-deterministic computational models and methods to support more efficient and cost effective design of spacecraft components;
- Methods for synthesizing tool components resident at different sites;
- Intelligent and adaptable interfaces for interconnectivity of heterogeneous software tools;
- Methods for assembling and synthesizing single discipline models into discipline sub-system models;
- Methods for synthesizing multiple discipline models into integrated systems engineering models;
- Approaches for integrating and efficient utilization of virtual reality systems in advanced engineering environments\*;

- Methods and processes for integrating cost analysis and risk management capabilities into advanced engineering environments\*;
- Technologies that enable collaboration amongst geographically dispersed groups of design engineers and mission scientists.
- Technologies which enable fusion of artificial intelligence and knowledge bases into advanced engineering environments\*; and
- Methods for integrating non-traditional tools (including learning system tools such as artificial neural networks), and non-deterministic tools into advanced engineering environments.

\*Advanced engineering environments refers to next generation integrated end-to-end life cycle design systems which are collaborative, intelligent and intuitive to use.

## **A.10 Atmospheric Systems and In-Space Operations**

This Thrust Area solicits proposals to improve the performance, efficiency, and safety of atmospheric and in-space operations, including ascent, descent, and entry, so as to enable deep space and human exploration missions with greatly reduced trip times, lower cost, and increased capability.

Of specific interest in this solicitation is the development of:

- Maneuvering, entry, and ascent system concepts that dramatically reduce spacecraft mass, volume, and cost, and improve safety;
- Significantly improved robotic joints, low power actuators, end-effectors, tools, and mechanisms that can be used in human-scaled, dexterous, in-space, maintenance and servicing robots;
- Reliable and safe planetary aerial systems, deployment systems, and aerial control concepts that dramatically reduce spacecraft mass, volume, and cost; and
- In-space operation systems or concepts that enhance the synergistic integration of spacecraft systems and consequently reduce spacecraft mass, volume, and cost.

## **A.11 Education/Public Outreach (E/PO) Proposals**

### **1. Scope of Program**

The Office of Space Science (OSS) has developed a comprehensive approach for making education at all levels (with a particular emphasis on K-14 education) and the enhancement of public understanding of space science and/or technology integral parts of all of its missions and research programs. The two key documents that establish the basic policies and guide all OSS Education and Outreach activities are a strategic plan, entitled *Partners in Education: A*



*Strategy for Integrating Education and Public Outreach Into NASA's Space Science Programs* (March 1995), and an implementation plan, entitled *Implementing the Office of Space Science (OSS) Education/Public Outreach Strategy* (October 1996). Both of these documents may be obtained either by selecting Education and Public Outreach from the menu on the OSS homepage at <http://spacescience.nasa.gov>, or from Dr. Jeffrey Rosendhal, Code S, Office of Space Science, NASA Headquarters, Washington, DC 20546-0001.

In accord with these established OSS policies, proposers to any OSS NRA are strongly encouraged to include an Education/Public Outreach (E/PO) component as part of their research proposal. In addition, anyone holding an existing multiple year research award funded through any previous OSS NRA is encouraged to propose an E/PO supplement to their award (see details in Section 3 below). The following guidelines apply to all proposed E/PO activities:

- An E/PO activity will be funded only in conjunction with an award for a "parent" research proposal;
- The proposed E/PO activity is expected to have a general intellectual linkage to the objectives of its "parent" proposal and/or the expertise of its PI;
- The period of performance of the E/PO activity may not exceed that of its "parent" research award;
- Up to \$10K per year may be proposed for an E/PO program, although larger budgets may be considered if funds permit for a few exceptionally meritorious activities, and for "Institutional" E/PO proposals (see Section 3); and
- NASA requests (but does not require) that the institutional overhead for an E/PO budget be waived by the submitting organization, since in many cases such activities will be of direct value to local educational and/or public science institutions and the budget available for this OSS E/PO program is extremely restricted.

E/PO funding is considered as an add-on over and above any funding guidelines for research proposals that may be given elsewhere in this NRA. E/PO proposals will be evaluated (see criteria below) by appropriately qualified scientific, education, and outreach personnel, and the substance of these reviews will be conveyed to the proposers as part of their debriefings. The OSS Selecting Official will take into account proposed E/PO tasks and their ratings when deciding on final selections and funding levels and as an aid in discriminating between research proposals having otherwise comparable merits.

## 2. Evaluation Criteria

There are two classes of evaluation criteria against which proposed OSS E/PO activities will be evaluated. The general criteria to be applied to the evaluation of all proposals, which reflect requirements necessary for further consideration of an E/PO proposal, are:

- The quality, scope, and realism of the proposed E/PO program including the adequacy, appropriateness, and realism of the proposed budget;

- The capability and commitment of the proposer and the proposer's team, and the direct involvement of one or more proposal team members in overseeing and carrying out the proposed E/PO program;
- The establishment or continuation of effective partnerships with institutions and/or personnel in the fields of educational and/or public outreach as the basis for and an integral element of the proposed E/PO program; and
- The appropriateness of plans for evaluating the effectiveness and impact of the proposed education/outreach activity.

To ensure that the goals and objectives of the OSS E/PO strategy are realized in practice, proposals will also be evaluated using one or more of the following specific criteria. Because of the modest financial scope of this program, it is recognized that not all proposals can (or even should) address all of these specific factors. Therefore, only the applicable subset will be considered in evaluating each individual proposal. An educationally sound, well-posed and focused effort that will clearly be effective in reaching its intended target audience is preferable to an unrealistically broad effort. These specific criteria are:

- For proposals dealing directly with or strongly affecting the formal education system (e.g., through teacher workshops or student programs carried out at informal education institutions such as science museums and planetariums), the degree to which the proposed E/PO effort is aligned with and linked to nationally recognized and endorsed education reform efforts and/or reform efforts at the state or local levels;
- The degree to which the proposed E/PO effort contributes to the training, involvement, and broad understanding of underserved and/or underutilized groups in science and technology; and/or
- The potential for the proposed E/PO activity to expand its scope by having an impact beyond the direct beneficiaries, reaching relatively large audiences, being suitable for replication or broad dissemination, or drawing on resources beyond those directly requested in the proposal.

Although creativity and innovation are certainly encouraged, note that neither of these sets of criteria focuses on the originality of the proposed effort. Instead, NASA seeks assurance that the proposer is personally committed to the E/PO effort and that the PI and/or appropriate research team members will be actively involved in carrying out a meaningful, effective, credible, and appropriate E/PO activity; that such an activity has been planned and will be executed; and that the proposed investment of resources will make a significant contribution towards meeting stated plans and objectives. To aid proposers in the preparation of their proposals, as well as to ensure that reviews are carried out on a consistent basis aligned with the OSS Education Strategy and Implementation Plan, an *Explanatory Guide* to E/PO evaluation criteria has been prepared and may be found by linking through *Education and Public Outreach* at the Web site <http://spacescience.nasa.gov>.

### 3. Special Case E/PO Proposals

There are three special cases for the submission of E/PO proposals that may be considered by interested participants in OSS programs:

#### 3.1 Submission of the Same E/PO Proposal to Multiple Program Elements within a Single NRA

OSS recognizes that some proposers may submit research proposals to more than one program element offered in a single NRA, or may submit more than one research proposal to the same program element of a single NRA. In either case, it is permissible to submit the same E/PO proposal with all such research proposals subject to three conditions: (i) that OSS will review such an E/PO proposal only the first time it is submitted; (ii) that this one evaluation will carry through to all further submissions of that E/PO proposal for that one NRA; and (iii) that such an E/PO proposal will be funded only once. The Web page that is used for the submission of the E/PO proposal (see Section 5 below) provides for entering information to indicate to OSS that an E/PO proposal has been submitted in conjunction with another research proposal for a given NRA. Note that in such a case, the E/PO proposal must be resubmitted in the identical form as it was the first time; OSS will not separately evaluate E/PO proposals that have only minor changes between such multiple submissions. Substantially different E/PO proposals will, of course, be considered individually.

#### 3.2 "Institutional" E/PO Proposals

Based on recent experience, OSS recognizes that multiple proposers from the same institution who are responding to the same NRA (or single program element within a multiple program NRA) may wish to submit a common, collaborative "Institutional" E/PO proposal. Such proposals should be of larger scope and would be expected to have a larger impact than that possible under the parentage of a single research proposal. Therefore, NASA OSS allows the submission of a common Institutional E/PO proposal involving an arbitrary number of proposers from that one institution subject to the following conditions:

- The identical E/PO proposal must be submitted in conjunction with every "parent" research proposal submitted from that institution for a single given program element. The Web page that is used for the submission of the E/PO proposal (see Section 5 below) provides for entering information to indicate to OSS that the E/PO proposal is an Institutional Proposal. It must be clearly marked as an Institutional proposal, identify all the separate research proposals associated with it, identify a team leader for the overall E/PO effort (who may be someone from that institution other than one of the proposing Principal Investigators), and identify all participating personnel.
- Such an Institutional proposal will be reviewed only once by NASA, and a decision whether to fund that proposal (or parts of it--see below) will be made on the basis of that one review.

- The maximum funding that will be allowed for such an Institutional E/PO proposal is \$7.5K per year for each one of the parent research proposals with which the umbrella E/PO effort is associated.
- Because not all the parent research proposals associated with a particular Institutional E/PO effort may be accepted, the Institutional proposal must clearly identify how the different elements of the E/PO proposal are related to each other, discuss the consequences of a partial selection (and concomitant funding limitation), and clearly demonstrate the continued viability (including arrangements for leadership of the overall effort) of the proposed program should a partial selection be offered. The page limit for an Institutional E/PO proposal is expanded to five pages (one extra page from that indicated in Section 5 below) to allow discussion of these issues.

### 3.3 E/PO Proposal as a Supplement to an Existing, Multiple Year OSS NRA Award

The PI of an existing multiple year award selected through any OSS NRA (including this one) having at least one year remaining in its period of performance may submit an E/PO proposal as a supplement to that parent research award. The period of performance for such a supplemental E/PO activity is limited to the balance of the period of performance of the research award. Such a supplemental E/PO proposal should be prepared as a stand-alone package following the format and content guidelines given in Section 5 and submitted in each of two ways:

- (i) as two hard copies submitted with the Progress Report required for the annual funding allotment needed to continue the parent award; and
- (ii) as an electronic submission to the Web site identified in Section 5 below (note: for this option, the Web site will request the information needed to coordinate the E/PO supplement with its parent research award, in particular, the grant or contract number and title of the "parent" award, the names of the NASA program and Program Executive under which that award was first made; and the anniversary date of the parent award).

Such E/PO supplement proposals will be reviewed using the evaluation criteria described above, and, if accepted, the E/PO funding is restricted to start on the anniversary date of the parent award.

## 4. Assistance for the Preparation of E/PO Proposals

NASA OSS has established a nation-wide infrastructure of space science education/outreach groups whose purpose is to directly aid investigators in identifying and developing high quality E/PO opportunities. This infrastructure provides the coordination, background, and linkages for fostering partnerships between the space science and/or technology and E/PO communities, and

the services needed to establish and maintain a vital national, coordinated, long-term OSS E/PO program. Of particular interest to proposers to this NRA are two elements of this system (which are also described in more detail in the OSS education/outreach implementation plan referred to in Section 1 above):

- Four OSS science theme-oriented E/PO "Forums" to help orchestrate and organize in a comprehensive way the education/outreach aspects of OSS space science and/or technology missions and research programs, and provide both the science/technology and education communities with ready access to relevant E/PO programs and products; and
- Five regional E/PO "Broker/Facilitators" to search out and establish high leverage opportunities, arrange alliances between educators and OSS-supported investigators, and help those investigators turn results from space science and/or technology missions and programs into educationally-appropriate activities suitable for regional and/or national dissemination

Prospective proposers are strongly encouraged to make use of these groups to help identify suitable E/PO opportunities and arrange appropriate alliances. Proposers should be careful to note that these Forums and Broker/Facilitators have been established to provide help, but the responsibility for actually developing the E/PO program and writing the proposal is that of the proposer. Points of contact and addresses for all of these E/PO Forums and Broker/Facilitators may be found by opening *Education and Public Outreach* from the menu of the OSS homepage at <http://spacescience.nasa.gov/osstech>.

## 5. Preparation and Submission of an E/PO Proposal

In order to be considered for evaluation, E/PO proposals must adhere to the following formats and also must be submitted both electronically and in hard copy as described below.

- An E/PO proposal is to consist of a contiguous body and budget:
  - The body of the E/PO proposal is limited to four pages ( <17,000 characters, including spaces, using the fonts and page layouts specified elsewhere in this NRA) and must include the following parts: a brief abstract of the proposed activity (not to exceed 800 characters); an expanded description of the E/PO objectives and planned activities; a description of the intended involvement of the Principal Investigator and/or key proposal team members in the proposed E/PO effort; a description of any educational personnel who are involved in the effort, including proposed partnership institutions (together with specific indicators of commitment on the part of partners where appropriate); a description of how the effort will be managed; and a brief explanation of the requested E/PO budget. Note that the PI or one of the team members of the parent research proposal must have the prime responsibility for overseeing the implementation of the proposed E/PO activity. The responsible individual should be clearly identified in the body of the E/PO proposal.

- The period of performance of an E/PO activity may not exceed that of the parent proposal. The E/PO budget must be summarized for its intended total period of performance, as well as for each individual year thereof, using the format entitled *Budget Summary for Optional Education/Public Outreach Proposal* given at the end of this program element (therefore, an E/PO effort proposed for a three year period of performance will require four budget sheets). In addition, this E/PO budget must be integrated line-for-line into the *Budget Summary* for the entire parent research proposal discussed in Section C.5 of Appendix C of this NRA.
- An E/PO proposal (both body and budget) must be submitted by each of two separate ways:
  - As an electronic submission (for the evaluation process) by uploading it, including its Budget Summary sheets, to the secure Web site <http://cass.jsc.nasa.gov/panel>, which provides instructions for this activity using a wide variety of formats. In accordance with the size limits specified above, the peer evaluations will consider only the first 800 characters submitted for the E/PO abstract and 17,000 characters for its body. Proposers without Web access or who experience difficulty in using this site may request assistance from the Lunar and Planetary Institute by E-mail at [panel@lpi.jsc.nasa.gov](mailto:panel@lpi.jsc.nasa.gov) or by phone at (281) 486-2136; and
  - As part of the total hard-copy version of the research proposal (see the ordered list of component parts for proposals elsewhere in this NRA); also note that the Cover Page for the research proposal must indicate that an E/PO proposal is included by checking the appropriate notification on the form provided on the Web site for its submission.

## 6. Reporting Activities for Approved E/PO Proposals

In order to assist OSS in obtaining a coherent picture of the entire portfolio of E/PO efforts supported across all OSS programs, the appropriate OSS Education Forum (see section 4 above) will contact proposers whose NRA E/PO components are selected to obtain summary information concerning the nature of and intended audience for their selected E/PO effort. In addition, a brief E/PO progress report will be required in conjunction with the annual progress report required for the continuation of the parent research award. A more complete report will also be required at the completion of the E/PO activity. The Education Forums will supply a simple template for preparation of such reports.

## 7. Additional Information

Questions about this E/PO program may be directed to:

Dr. David Bohlin  
Code SR  
Office of Space Science  
National Aeronautics and Space Administration  
Washington DC 20546-0001  
Telephone: (202) 358-0880  
E-mail: david.bohlin@hq.nasa.gov

Finally, attention is also called to the Initiative to Develop Education through Astronomy and Space Science (IDEAS) program administered by the Space Telescope Science Institute (STScI) on behalf of OSS. The IDEAS program is open to any space scientist based in the U.S. regardless of whether or not they hold a research grant from NASA OSS. This program, which selects proposals yearly, provides awards of up to \$40K to foster the development of innovative approaches to space science education and outreach by space scientists and their educator partners. The annual solicitation for the IDEAS program is typically released in July with proposals due in October. The annual request for proposals is posted at <http://ideas.stsci.edu>. Inquiries may be addressed by E-mail to IDEAS@stsci.edu or by postal mail to:

IDEAS Program  
Office of Public Outreach  
Space Telescope Science Institute  
3700 San Martin Drive  
Baltimore, MD 21218.

**INSTRUCTIONS FOR RESPONDING TO  
NASA RESEARCH ANNOUNCEMENTS**

**Part 1852.235-72**

NASA Federal Acquisition Regulations (FAR) Supplement (NFS)  
Version 89.90, Effective January 1997.

Accessible

<<http://www.hq.nasa.gov/office/procurement/regs/nfstoc.htm>>,  
open 'Part 1852.228 to 1852.241' from menu.

(a). General.

(1) Proposals received in response to a NASA Research Announcement (NRA) will be used only for evaluation purposes. NASA does not allow a proposal, the contents of which are not available without restriction from another source, or any unique ideas submitted in response to an NRA to be used as the basis of a solicitation or in negotiation with other organizations, nor is a preaward synopsis published for individual proposals.

(2) A solicited proposal that results in a NASA award becomes part of the record of that transaction and may be available to the public on specific request; however, information or material that NASA and the awardee mutually agree to be of a privileged nature will be held in confidence to the extent permitted by law, including the Freedom of Information Act.

(3) NRA's contain programmatic information and certain requirements which apply only to proposals prepared in response to that particular announcement. These instructions contain the general proposal preparation information which applies to responses to all NRA's.

(4) A contract, grant, cooperative agreement, or other agreement may be used to accomplish an effort funded in response to an NRA. NASA will determine the appropriate instrument. Contracts resulting from NRA's are subject to the Federal Acquisition Regulation (FAR) and the NASA FAR Supplement (NFS). Any resultant grants or cooperative agreements will be awarded and administered in accordance with the NASA Grant and Cooperative Agreement Handbook (NPG 5800.1).

(5) NASA does not have mandatory forms or formats for responses to NRA's; however, it is requested that proposals conform to the guidelines in these instructions. NASA may accept proposals without discussion; hence, proposals should initially be as complete as possible and be submitted on the proposers' most favorable terms.



(6) To be considered for award, a submission must, at a minimum, present a specific project within the areas delineated by the NRA; contain sufficient technical and cost information to permit a meaningful evaluation; be signed by an official authorized to legally bind the submitting organization; not merely offer to perform standard services or to just provide computer facilities or services; and not significantly duplicate a more specific current or pending NASA solicitation.

(b). NRA-Specific Items. Several proposal submission items appear in the NRA itself: the unique NRA identifier, when to submit proposals, where to send proposals, number of copies required, and sources for more information. Items included in these instructions may be supplemented by the NRA.

(c). Proposal Content. The following information is needed to permit consideration in an objective manner. NRA's will generally specify topics for which additional information or greater detail is desirable. Each proposal copy shall contain all submitted material, including a copy of the transmittal letter if it contains substantive information.

(1) *Transmittal Letter or Prefatory Material*.

- (i) The legal name and address of the organization and specific division or campus identification, if part of a larger organization;
- (ii) A brief, scientifically valid project title intelligible to a scientifically literate reader and suitable for use in the public press;
- (iii) Type of organization: e.g., profit, nonprofit, educational, small business, minority, women-owned, etc.;
- (iv) Name and telephone number of the principal investigator and business personnel who may be contacted during evaluation or negotiation;
- (v) Identification of other organizations that are currently evaluating a proposal for the same efforts;
- (vi) Identification of the NRA, by number and title, to which the proposal is responding;
- (vii) Dollar amount requested, desired starting date, and duration of project;
- (viii) Date of submission; and
- (ix) Signature of a responsible official or authorized representative of the organization, or any other person authorized to legally bind the organization(unless the signature appears on the proposal itself).

(2) *Restriction on Use and Disclosure of Proposal Information.* Information contained in proposals is used for evaluation purposes only. Offerors or quoters should, in order to maximize protection of trade secrets or other information that is confidential or privileged, place the following Notice on the title page of the proposal and specify the information subject to the notice by inserting an appropriate identification in the Notice. In any event, information contained in proposals will be protected to the extent permitted by law, but NASA assumes no liability for use and disclosure of information not made subject to the Notice.

**Notice**

**Restriction on Use and Disclosure of Proposal Information**

The information (data) contained in [insert page numbers or other identification] of this proposal constitutes a trade secret and/or information that is commercial or financial and confidential or privileged. It is furnished to the Government in confidence with the understanding that it will not, without permission of the offeror, be used or disclosed other than for evaluation purposes; provided, however, that in the event a contract(or other agreement) is awarded on the basis of this proposal, the Government shall have the right to use and disclose this information (data) to the extent provided in the contract(or other agreement). This restriction does not limit the Government's right to use or disclose this information (data) if obtained from another source without restriction.

(3) *Abstract.* Include a concise (200-300 word if not otherwise specified in the NRA) abstract describing the objective and the method of approach.

(4) *Project Description.*

(i) The main body of the proposal shall be a detailed statement of the work to be undertaken and should include objectives and expected significance, relation to the present state of knowledge, and relation to previous work done on the project and to related work in progress elsewhere. The statement should outline the plan of work, including the broad design of experiments to be undertaken and a description of experimental methods and procedures. The project description should address the evaluation factors in these instructions and any specific factors in the NRA. Any substantial collaboration with individuals not referred to in the budget or use of consultants should be described. Subcontracting significant portions of a research project is discouraged.

(ii) When it is expected that the effort will require more than one year, the proposal should cover the complete project to the extent that it can be reasonably anticipated. Principal emphasis should be on the first year of work, and the description should distinguish clearly between the first year's work and work planned for subsequent years.

(5) *Management Approach.* For large or complex efforts involving interactions among numerous individuals or other organizations, plans for distribution of responsibilities and arrangements for ensuring a coordinated effort should be described.

(6) *Personnel.* The principal investigator is responsible for supervision of the work and participates in the conduct of the research regardless of whether or not compensated under the award. A short biographical sketch of the principal investigator, a list of principal publications, and any exceptional qualifications should be included. Omit social security number and other personal items which do not merit consideration in evaluation of the proposal. Give similar biographical information on other senior professional personnel who will be directly associated with the project. Give the names and titles of any other scientists and technical personnel associated substantially with the project in an advisory capacity. Universities should list the approximate number of students or other assistants, together with information as to their level of academic attainment. Any special industry-university cooperative arrangements should be described.

(7) *Facilities and Equipment.*

(i) Describe available facilities and major items of equipment especially adapted or suited to the proposed project, and any additional major equipment that will be required. Identify any Government-owned facilities, industrial plant equipment, or special tooling that are proposed for use. Include evidence of its availability and the cognizant Government points of contact.

(ii) Before requesting a major item of capital equipment, the proposer should determine if sharing or loan of equipment already within the organization is a feasible alternative. Where such arrangements cannot be made, the proposal should so state. The need for items that typically can be used for research and non research purposes should be explained.

(8) *Proposed Costs.*

(i) Proposals should contain cost and technical parts in one volume: do not use separate "confidential" salary pages. As applicable, include separate cost estimates for salaries and wages, fringe benefits, equipment, expendable materials and supplies, services, domestic and foreign travel, ADP expenses, publication or page charges, consultants, subcontracts, other miscellaneous identifiable direct costs, and indirect costs. List salaries and wages in appropriate organizational categories (e.g., principal investigator, other scientific and engineering professionals, graduate students, research assistants, and technicians and other non-professional personnel). Estimate all staffing data in terms of staff-months or fractions of full-time.

(ii) Explanatory notes should accompany the cost proposal to provide identification and estimated cost of major capital equipment items to be acquired, purpose and estimated number and lengths of trips planned, basis for indirect cost computation(including date of most recent negotiation and cognizant agency), and clarification of other items in the cost proposal that are not self-evident. List estimated expenses as yearly requirements by major work phases.

(iii) Allowable costs are governed by FAR Part 31 and the NASA FAR Supplement Part 1831(and OMB Circulars A-21 for educational institutions and A-122 for nonprofit organizations).

(9) *Security.* Proposals should not contain security classified material. If the research requires access to or may generate security classified information, the submitter will be required to comply with Government security regulations.

(10) *Current Support.* For other current projects being conducted by the principal investigator, provide title of project, sponsoring agency, and ending date.

(i) Include any required statements of environmental impact of the research, human subject or animal care provisions, conflict of interest, or on such other topics as may be required by the nature of the effort and current statutes, executive orders, or other current Government-wide guidelines.

(ii) Proposers should include a brief description of the organization, its facilities, and previous work experience in the field of the proposal. Identify the cognizant Government audit agency, inspection agency, and administrative contracting officer, when applicable.

(d). Renewal Proposals

(1) Renewal proposals for existing awards will be considered in the same manner as proposals for new endeavors. A renewal proposal should not repeat all of the information that was in the original proposal. The renewal proposal should refer to its predecessor, update the parts that are no longer current, and indicate what elements of the research are expected to be covered during the period for which support is desired. A description of any significant findings since the most recent progress report should be included. The renewal proposal should treat, in reasonable detail, the plans for the next period, contain a cost estimate, and otherwise adhere to these instructions.

(2) NASA may renew an effort either through amendment of an existing contract or by a new award.

(e). Length. Unless otherwise specified in the NRA, effort should be made to keep proposals as brief as possible, concentrating on substantive material. Few proposals need exceed 15-20 pages. Necessary detailed information, such as reprints, should be included as attachments. A complete set of attachments is necessary for each copy of the proposal. As proposals are not returned, avoid use of "one-of-a-kind" attachments.

(f). Joint Proposals.

(1) Where multiple organizations are involved, the proposal may be submitted by only one of them. It should clearly describe the role to be played by the other organizations and indicate the legal and managerial arrangements contemplated. In other instances, simultaneous submission of related proposals from each organization might be appropriate, in which case parallel awards would be made.

(2) Where a project of a cooperative nature with NASA is contemplated, describe the contributions expected from any participating NASA investigator and agency facilities or equipment which may be required. The proposal must be confined only to that which the proposing organization can commit itself. "Joint" proposals which specify the internal arrangements NASA will actually make are not acceptable as a means of establishing an agency commitment.

(g). Late Proposals. A proposal or modification received after the date or dates specified in an NRA may be considered if doing so is in the best interests of the Government.

(h). Withdrawal. Proposals may be withdrawn by the proposer at any time before award. Offerors are requested to notify NASA if the proposal is funded by another organization or of other changed circumstances which dictate termination of evaluation.

(i). Evaluation Factors

(1) Unless otherwise specified in the NRA, the principal elements (of approximately equal weight) considered in evaluating a proposal are its relevance to NASA's objectives, intrinsic merit, and cost.

(2) Evaluation of a proposal's relevance to NASA's objectives includes the consideration of the potential contribution of the effort to NASA's mission.

(3) Evaluation of its intrinsic merit includes the consideration of the following factors of equal importance:

(i) Overall scientific or technical merit of the proposal or unique and innovative methods, approaches, or concepts demonstrated by the proposal.

(ii) Offeror's capabilities, related experience, facilities, techniques, or unique combinations of these which are integral factors for achieving the proposal objectives.

(iii) The qualifications, capabilities, and experience of the proposed principal investigator, team leader, or key personnel critical in achieving the proposal objectives.

(iv) Overall standing among similar proposals and/or evaluation against the state-of-the-art.

(4) Evaluation of the cost of a proposed effort may include the realism and reasonableness of the proposed cost and available funds.

(j). Evaluation Techniques. Selection decisions will be made following peer and/or scientific review of the proposals. Several evaluation techniques are regularly used within NASA. In all cases, proposals are subject to scientific review by discipline specialists in the area of the proposal. Some proposals are reviewed entirely in-house, others are evaluated by a combination of in-house and selected external reviewers, while yet others are subject to the full external peer review technique (with due regard for conflict-of-interest and protection of proposal information), such as by mail or through assembled panels. The final decisions are made by a NASA selecting official. A proposal which is scientifically and programmatically meritorious, but not selected for award during its initial review, may be included in subsequent reviews unless the proposer requests otherwise.

(k). Selection for Award.

(1) When a proposal is not selected for award, the proposer will be notified. NASA will explain generally why the proposal was not selected. Proposers desiring additional information may contact the selecting official who will arrange a debriefing.

(2) When a proposal is selected for award, negotiation and award will be handled by the procurement office in the funding installation. The proposal is used as the basis for negotiation. The contracting officer may request certain business data and may forward a model award instrument and other information pertinent to negotiation.

(l). Cancellation of NRA. NASA reserves the right to make no awards under this NRA and to cancel this NRA. NASA assumes no liability for canceling the NRA or for anyone's failure to receive actual notice of cancellation.

(End of provision)

**SPECIFIC GUIDANCE FOR PROPOSAL PREPARATION AND SUBMISSION**

**C.1. Introduction**

- C.1.1 General Provisions and Policies
- C.1.2 Types of Proposing Institutions
- C.1.3 Proposal Personnel
- C.1.4 Proposal Evaluation
- C.1.5 Proposal Selection and Implementation

**C.2. Notice of Intent to Propose**

**C.3. Guidelines for International Participation**

**C.4. Guidelines for Preparation of Proposal**

- C.4.1 Standard Formats for Proposals
- C.4.2 Checklist For Proposal Preparation and Submission
- C.4.3 Details of Proposal Contents
  - Cover Page/Proposal Summary
  - Table of Contents
  - Summary of Personnel Commitments and Costs
  - Budget Summary
  - Scientific/Technical/Management Section
  - Facilities and Equipment
  - Curriculum Vitae
  - Current and Pending Support
  - Co-I and Collaborator Letter(s) of Commitment
  - Budget Summary and Details
  - Progress Report
  - Proposing Institutional Budget

**C.5. Forms and Certifications**

- Budget Summary and Instructions
- Certifications (*Debarment...; Lobbying; and Civil Rights*)

## **C.1 Introduction**

### **C.1.1 General Provisions and Policies**

- *Relationship of Appendices B and C.* The material in Appendix C augments and supplements the material in Appendix B of this NRA. In case of conflict, the material in Appendix C takes precedence.
- *Who May Propose to this NRA.* NASA welcomes proposals in response to this NRA from all qualified proposers. Participation in this program is open to all other categories of U.S. and non-U.S. organizations, including educational institutions, industry, nonprofit institutions, NASA Centers, and other Government agencies. Historically Black Colleges and Universities (HBCU's), other minority educational institutions, and small businesses and organizations owned and controlled by socially and economically disadvantaged individuals or women are particularly encouraged to apply. In accordance with Federal statutes and NASA policy, no eligible applicant shall be excluded from participation in, denied the benefits of, or be subjected to discrimination under any program or activity receiving financial assistance from NASA on the grounds of race, color, creed, age, sex, national origin, or disability.
- *Anticipated Level of Competition for Selection.* Prospective proposers are advised that OSS program solicitations have traditionally been extremely competitive. Because of funding limitations, typically as few as one out of four to five proposals have been selected for funding in the last several years.
- *Public Access to Data.* As a matter of NASA policy, all scientific data taken in the performance of a NASA research award are considered to be public domain. In addition, NASA may judge that new data obtained through an investigation selected through this NRA may be of value to the science community at large. If so, NASA reserves the right to direct that these data be deposited in an approved public data archive and, if so, will negotiate appropriate funding to enable the reduction and calibration of the data into a format amenable for use by peer scientists.
- *Late proposals.* NASA's general policy on late proposals is given in Section (g) of Appendix B and states that such a proposal may be considered only if it is judged to be in the best interests of the Government. Owing to the historically large over-subscription of proposals for NASA's programs, a proposal submitted after the published deadline is unlikely to be considered of uniquely greater value to NASA than the proposals that are submitted on time. Finally, note that processing delays at the proposer's home institution or its method of shipping does not excuse the late submission of a proposal.



### C.1.2 Types of Proposing Institutions

NASA will accept proposals in response to this NRA from all types of U.S. and non-U.S. institutions y (proposals from non-U.S. institutions should adhere to the provision of Section 3 of this Appendix). As an aid to NASA in deciding on the appropriate funding instrument in the event that the proposal is selected for funding, one of the categories listed below must be indicated at the appropriate line on the *Cover Page*:

- *Educational institution.* A university or two- and four-year college (including a U.S. community college) accredited to confer degrees beyond that of the K-12 grade levels (all such institutions are considered by NASA as nonprofit).
- *Nonprofit, nonacademic organization.* A private or Government supported research laboratory, university consortium, museum, observatory, or similar organization that supports advanced research but whose central charter is not for training of students.
- *Commercial organization.* An organization of any size that operates for profit (i.e., on a fee basis) with appropriate capabilities and interests to conduct advanced technology development.
- *Other Federal Agency.* Any non-NASA, U.S. Federal Executive agency or Federally Funded Research and Development Center (FFRDC) sponsored by a Federal agency.
- *Unaffiliated U.S. resident.* Any person residing in the U.S., whether a U.S. citizen or resident alien, who has the capabilities and access to facilities for carrying out the proposed project and who, if selected, agrees to fiscal arrangements that, in NASA's opinion, ensures responsible management of appropriated Federal funds.
- *Non-U.S. Organizations.* Institutions outside the U.S. that propose on the basis of a policy of no exchange of funds; consult Section 3 of this Appendix.

### C.1.3 Proposal Personnel

Every organization submitting a proposal in response to this NRA must designate a single *Principal Investigator* (PI) who will be responsible for the quality and direction of the entire proposed investigation and for the use of all awarded funds. Note that NASA does not accept the designation of a "Co-Principal Investigator."

In addition to the PI, a critically important person needed for the execution of a proposal through the contribution of unique expertise and/or capabilities and who serves under the direction of the PI may be identified as a *Co-Investigator* (Co-I). Regardless of whether he/she receives compensation directly through the award, a Co-I must have a well-defined role in the investigation that is explicitly defined in the *Management* section of the proposal. Except for certain cases of a Co-I being identified as an "Institutional PI" (see below), any Co-I at an institution other than that of the PI is to be funded by subcontract through the proposing institution. Finally, written commitment of each Co-I to participate in the proposed investigation is required by way of a brief letter from him/her even if they are from the proposing PI institution. Owing to unique circumstances, there are two special designations for a Co-I that a proposal may make in its Management section as appropriate:

- A Co-I may be designated as the *Technology PI* for those cases where the proposing institution does not permit that individual to formally serve as the PI as defined above (e.g., nontenure faculty, research associates, and/or postdoctoral personnel). In such a case, the *Technology PI* will be understood by NASA to be in charge of the technical direction of the proposed work, although the formally designated PI is still held responsible for the overall direction of the effort and the use of funds.
- A Co-I may be designated as an *Institutional PI* if he/she is from an institution other than the proposing organization that is making a major contribution to the proposal (e.g., a substantial portion of an experimental investigation), and to which NASA may choose to issue a separate award rather than expecting the PI institution to provide a subcontract. In this case, the *Institutional PI* serves as the point of contact for that separate award to his/her institution but the proposal PI is still responsible for the overall technical direction of the effort. Funding a single proposal by such multiple awards is allowed only if explicitly noted in the program description of this NRA or if explicitly approved by the cognizant Thrust Area Manager.

In addition to Co-I's, proposals in response to this NRA may also identify *Collaborators*, who are individuals that are less critical to the overall proposal than a Co-I but who are committed to provide a focused though unfunded contribution to a specific task relevant to the proposal. As noted above for Co-I's, proposals submitted to this NRA must include a brief letter of commitment from each Collaborator that describes their specific, intended contribution to the investigation.

#### C.1.4 Proposal Evaluation

Although NASA secures scientific and technical evaluations from appropriately qualified peers of the proposers, proposers are expected to provide sufficient detail to enable evaluation by persons who are knowledgeable of but not necessarily specialists in the proposed research. The evaluation criteria in Appendix B, part (i), as amended below, applies to this NRA:

##### (i) Evaluation Factors.

- (1) Unless otherwise specified in the NRA, the principal criteria (in descending order of importance) that apply in evaluating a proposal are its intrinsic merit, its relevance to NASA's objectives, and its cost.
- (2) Evaluation of intrinsic merit includes consideration of the following factors listed in approximate order of decreasing importance:
  - The overall technical merit of the proposal and/or unique and innovative methods, approaches, concepts, or advanced technologies demonstrated by the proposal, and the potential impact of the proposed development to its field;

- The breadth of applicability of the technology. Applications of the technology development must be “cross-Enterprise,” that is, it must benefit at least two of the three following NASA space Enterprises: The Earth Science Enterprise, the Space Science Enterprise, or the Human Exploration and Development of Space. Further information on the NASA Enterprises is contained in the NASA Strategic Plan at URL: <http://www.hq.nasa.gov/office/nsp/cover.html>.
- The qualifications, capabilities, and experience of the proposing Principal Investigator and all other personnel who are proposing to help achieve the proposal's objectives;
- The proposing institution's capabilities, related experience, facilities, techniques, or unique contributions of these that are integral factors for achieving the proposal objectives; and
- The overall standing of the proposal against the known state of the art.

(3) Relevance to NASA's objectives shall mean relevance to the specific objectives and goals as described in Appendix A of this NRA for which the proposal is submitted, as well as more generally to the NASA Enterprise goals as defined in the most current strategy documents.

(4) Evaluation of the cost of a proposed effort shall include the realism and reasonableness of the proposed cost and the comparison of that proposed cost to available funds.

#### C.1.5 Proposal Selection and Implementation

Following peer evaluation, the cognizant Thrust Area Manager will further review the top rated proposals against the programmatic objectives, program balance, and available financial resources. Based on the entirety of these factors, including judgment of the comparison of the scope and importance of the proposed investigation to its cost, the Thrust Area Manager then will present a recommendation for selection to the NASA Selecting Official (identified in this NRA's covering summary letter). The Selecting Official will select for funding those proposals judged worthy with respect to all of the evaluation criteria and for which financial resources are available.

Each proposer will be notified by postal or electronic mail of their selection or nonselection and offered a debriefing to explain that decision. Note that NASA reserves the right to offer selection of only a portion of a proposed investigation; in such a case the proposer will be given the opportunity to accept or decline the offer. Those recommended for selection will be informed of the recommended amount of their award and that their organization will be contacted by a NASA Procurement Office to arrange for an appropriate funding instrument (normally a grant or contract). In all cases, awards are made to the proposing institution, not directly to the proposal PI. Note that no financial commitment on the part of NASA or the Government may be inferred from any communication, even if in writing, from the NASA Thrust Area Manager or Selecting Official. Only a NASA Procurement Office can make financial commitments, obligations, or awards on behalf of the Agency and authorize the expenditure of funds.

## **C.2 Notice of Intent to Propose**

In order to plan for a timely and efficient peer review process, a *Notice of Intent* (NOI) to propose is requested by the deadline in the Cover Letter for this NRA. NASA understands that the submission of a NOI is neither a commitment to submit a proposal nor is information contained therein considered binding on the submitter. NOI's are to be submitted electronically by entering the requested information through the World Wide Web site identified in the Cover Letter (a point of contact is also provided for anyone without access to the Web or who experiences difficulty in using the specified site). As a rule, the NOI Web site will request at least the following information:

- reference to this NRA by its alpha-numeric identifier (this may be included on the Web site template);
- the Principal Investigator's name, physical mailing address, phone number, and E-mail address;
- the name(s) and institution(s) of any Co-Investigator(s) and/or Collaborator(s) known by the NOI due date;
- a descriptive title of the intended investigation; and,
- a brief description of the investigation to be proposed.

A separate NOI must be submitted for each intended proposal. Note that this NOI may take the form of being the preliminary version of the proposal *Cover Page/Proposal Summary*. If so, the Web site will provide a password to the user for future use in updating this information for the final *Cover Page/Proposal Summary* as the deadline for submission of the final proposal approaches.

## **C.3 Guidelines for International Participation**

NASA welcomes proposals from institutions from outside the U.S., as well as proposals from U.S. institutions that include collaboration with Co-Investigators at non-U.S. institutions. In either case, however, investigators working outside the U.S. are not eligible for funding from NASA. Therefore, proposals from non-U.S. institutions should not include a cost plan unless the proposal involves a Co-Investigator working in the U.S., in which case a budget for just that participation must be included. Proposals from non-U.S. institutions, and U.S. proposals that include non-U.S. participation, must be endorsed by the government agency or sponsoring institution in that country from which the non-U.S. participant is proposing. Such endorsement should indicate that the proposal merits careful consideration by NASA, and, that if the proposal is selected, sufficient funds will be made available to undertake the activity as proposed. In addition to sending the specified number of copies of the proposal to the address designated in this NRA, one copy of the proposal, along with a Letter of Endorsement from the sponsoring non-U.S. agency, must be forwarded to:

Ms. Wavalene Barnes  
NRA TBD  
Space Science and Aeronautics Division  
Code IS  
NASA Headquarters  
Washington, DC 20546-0001  
USA

All non-U.S. proposals must be typewritten in English and conform to all other standards for format and content specified in this NRA and will undergo the same evaluation and selection process as those originating in the U.S. All proposals must be received before the established proposal due date; those received after the closing date will be treated in accordance with NASA's standard policy for late proposals (see Appendix B). The sponsoring non-U.S. agencies may, in exceptional situations, forward a proposal to NASA without endorsement if endorsement is not possible before the announced closing date. In such cases, however, NASA's Space Science and Aeronautics Division in the Office of External Relations should be advised when a decision on endorsement can be expected.

Successful and unsuccessful non-U.S. proposers will be contacted directly by the NASA Office of Space Science Advanced Technology and Mission Studies Division concerning the selection or non-selection for their proposals, and copies of these letters will also be sent to the sponsoring organization. Should a non-U.S. proposal or a U.S. proposal with non-U.S. participation be selected, NASA's Space Science and Aeronautics Division will arrange with the non-U.S. sponsoring organization for the proposed participation on a no-exchange-of-funds basis, in which NASA and the non-U.S. sponsoring organization will each bear the cost of discharging their respective responsibilities. Depending on the nature and extent of the proposed cooperation, this arrangement will entail a letter of notification by NASA and either an exchange of letters between NASA and the sponsoring organization, or a Memorandum of Understanding (MOU).

#### **C.4 Guidelines for Preparation of Proposals**

##### **C.4.1 Standard Formats for Proposals**

Unless otherwise directed, the standard, default formats for proposals submitted in response to this NRA are as follows:

- Typewritten, English text using an easily read type font having no more than ~15 characters per inch on white 8.5x11 inch paper (or A4 stock for non-U.S. proposals), in single or double columns with at least 1 inch (2.5 cm) margins all around.
- Double-sided printing preferred but not required.
- Bound only with metal staples, i.e., no cardboard or plastic covers, or permanent binders (to facilitate recycling), and with an easily disassembled original copy (to enable NASA to make additional copies if needed).

- No fold out pages, colored illustrations, or photographs unless critical for the unique display of important proposal data.
- No material submitted on any type of electronic media, nor reference to sites on the World Wide Web for material needed to complete or review the proposal.
- Use of only metric and standard astronomical units.
- Strict adherence to the page limits given below, where each side of a sheet containing text or illustration counts as a page, each “n-page” fold-out counts as n-pages, and the page limit for the Science/Technical/Management section includes references and illustrations.

#### C.4.2 Checklist For Proposal Preparation and Submission:

---

### PRESUBMISSION ACTIVITIES

---

\_\_\_\_\_ ***Notice of Intent to Propose.*** Electronically submitted to the World Wide Web site by the due date given in the cover letter of this NRA.

\_\_\_\_\_ ***Cover Page/Proposal Summary.*** Electronically submitted to the World Wide Web site given in the cover letter of this NRA (note: this should be done in time to secure the specified original signatures on a printed hard copy of this item as required for submission with copies of the proposal itself by the proposal Due Date given in this NRA’s cover letter).

<b>CONSTITUENT PARTS OF A PROPOSAL</b> (required and optional, in order of assembly)
-----------------------------------------------------------------------------------------

	<u>Page Limits</u>
• <b><u>MAIN PROPOSAL</u></b>	
_____ <i>Cover Page/Proposal Summary</i>	Per printout from Web
_____ <i>Table Of Contents</i> (optional)	1
_____ <i>Summary Of Personnel Commitments and Costs</i>	1
_____ <i>Technical/Management Section</i>	8*
_____ <i>References</i>	As req’d
_____ <i>Facilities and Equipment</i> (as needed and appropriate)	2
_____ <i>Education/Public Outreach (E/PO) Proposal</i> (optional)	4
_____ <i>E/PO Budget Summary</i>	4
• <b><u>ANCILLARY INFORMATION:</u></b>	
_____ <i>Curriculum Vitae</i> for the PI:	3
	optional for each Co-I: 1
_____ <i>Current and Pending Support</i>	as req’d
_____ <i>Co-I and/or Collaborator Letter(s) of Commitment</i>	as req’d
_____ <i>Budget Summary and Details</i>	as req’d
_____ <i>Reprints/Preprints</i> (optional; 2 only if relevant to proposal)	N/A

\* including all illustrations, tables, and figures

---

## SUBMISSION ACTIVITIES

---

Cover Page/Proposal Summary. Print out final and complete version from Web site in time to secure the Principal Investigator and Authorizing Institutional Official signatures, to serve as the preface to the proposal (the *Cover Page/Proposal Summary* with original signatures must preface the original copy of the proposal).

Deliver required number of proposal hard copies to the specified address by close of business on the Due Date (see summary cover letter of this NRA for specifications).

### C.4.3 Details of Proposal Contents

All proposals in response to this NRA should be assembled with the following parts and in the order listed. Proposals that omit required or appropriate parts, or whose constituent parts exceed the page limits specified in section 4.2 may be returned without review. For completeness, each of the items below is cross-referenced to the corresponding part of Appendix B of this NRA by notations in brackets [...]. Note that several parts of Appendix B are not specifically cited but should also be considered for a complete understanding of all applicable policies and provisions.

- *Cover Page/Proposal Summary* [Reference: Appendix B.(c)(1) and (3)]. All proposals must be prefaced by an integrated *Cover Page/Proposal Summary* that contains important, required information (see below). This item is produced by electronically entering the requested information through the World Wide Web site specified in the summary cover letter of this NRA and then printing out a hard copy of the final material (Note: a point of contact is also identified for any proposer without access to the Web or who experiences difficulty in using the specified Web site). This printed hard copy is then used to obtain original signatures of the PI and an official from the proposing institution to submit with the original copy of the proposal. In addition, reproductions of this original *Cover Page/Proposal Summary* are used to preface the required printed copies of the proposal.

Upon accessing the specified Web site, at least the following information for the *Cover Page* will be requested (Note: additional programmatic information may be requested as specified in Appendix A of this NRA):

- The alpha-numeric identifier and name of this NRA (Note: these may already be included on the electronic form on the Web site).
- The proposing Principal Investigator's name and full physical, institutional mailing address, telephone and facsimile numbers, and E-mail address.
- An open block for the PI signature and date on the printed hard copy.
- A descriptive title of proposed investigation.
- The Grant or Contract Number of any existing NASA award for which the newly proposed work is a logical, justified follow-on activity.
- The name(s), institutional affiliation(s), and E-mail address(es) of any Co-Investigator(s) (Note: all Co-I's listed must also be functionally identified in the proposal).

- The physical mailing address, telephone number, and E-mail address of the office of sponsored programs at the proposing institution.
- The institutional endorsement, which requires the name and title of the Authorizing Institutional Official, the name of the proposing institution, and, for the hard copy submitted with proposal, a block for a signature and date.
- The designation of the type of proposing institution (using the definitions in Section 1.2 above).
- The proposed costs both by year and for the total proposed period of performance.

A block of space (about one page in length) will be provided in the electronic *Cover Page/Proposal Summary* form for a self-contained *Proposal Summary* of the proposed research activity. This *Summary* should include the following key information:

- A description of the key, central objectives of the proposed work in terms that allow a nonspecialist to grasp its essence, and a concise statement of the methods proposed to accomplish those proposed objectives.
- A statement of the perceived significance of the proposed work to NASA CETDP interests and the cognizant Thrust Area
- If the proposed effort is considered to be a continuation of work performed under a previous NASA award, a statement of the key accomplishments and citations to published and/or in-press articles derived from that award.

Note: NASA intends to publish the proposal title, the PI's name and institution, and the *Proposal Summary* of every selected investigation in a public data base. Therefore, the *Proposal Summary* should not include proprietary information that would preclude its unrestricted release (see also Appendix B, (a)(2) and (c)(2)).

Changes (such as whiteout or strikethrough) to the printed *Cover Page/Proposal Summary* that is submitted with the proposal are not permitted. Any needed changes to the information that has been submitted electronically may only be made by editing the electronic submission using the instructions of the Web page, after which the revised *Cover Page/Proposal Summary* is then printed for securing the necessary signatures.

Note two special features of the *Cover Page/Proposal Summary*: (i) the authorizing institutional signature now certifies that the proposing institution has read and is in compliance with the three required certifications printed in full (for reference only) at the end of this Appendix), and, therefore, it is not necessary to separately submit these certifications with the proposal; and (ii) electronic submission of only a *Cover Page/Proposal Summary* does not satisfy the deadline for proposal submission; the required number of copies of the proposal, one with original signatures, must be received at the indicated address by the proposal Due Date.

- *Table of Contents.* This item is optional but desirable.



- *Summary of Personnel Commitments and Costs.* The proposal must contain a one page summary that shows, in simple tabular form, the intended work commitment of the PI (and of every Co-I, if any) of their work effort for the proposed investigation both in time (rounded to the nearest 0.01 Work Year) and salary (rounded to the nearest \$1K) for each year of the proposed period of performance.

- *Technical/Management Section* [Reference: Appendix B.(c)(4), (5), and (6)].

This section is the main body of the proposal and should cover the following topics in the order given, all within the page limit noted above:

- The objectives and expected significance of the proposed development, including the perceived impact of the proposed work to the state of knowledge in the field and, if the proposal is a direct extension of an existing NASA award, how the proposed work is expected to build on and otherwise extend previous accomplishments by the proposer or others in the field;
- The technical approach and methodology to be employed in conducting the proposed development, including any special facilities of the proposing institution(s) and/or capabilities of the proposer(s) for carrying out the work (Note: it may be appropriate to further elaborate on this topic in the separate *Facilities and Equipment* section as described below);
- The relevance of the proposed work to past, present, and/or future NASA programs and interests and to the specific objectives given in this NRA;
- An outline of the general management plan for the proposed task, including anticipated key milestones for accomplishments and the management structure for the proposal personnel; and
- A clear statement of the expected contribution by the PI and by each Co-I identified for the proposed task, regardless of whether or not they derive support from the proposed budget.

This *Section* must include a list of references to citations in the main text; such citations must use standard, easily understood abbreviations of journals and/or books. This section may also contain illustrations that amplify and demonstrate key points of the proposal (including milestone schedules, as appropriate). Such illustrations should be of publication quality, of an easily viewed size, and have self-contained captions that do not contain critical information not provided elsewhere in the proposal.

- *References.* All citations given in the *Scientific/Technical/Management Section* must be included in a list of references, which should include the full title of the paper and/or book, as appropriate, and an easily understood abbreviation of the publication.

- *Facilities and Equipment* [Reference: Appendix B.(c)(7)]. If appropriate, this section should describe any major facilities (including any U.S. Government owned facilities) and/or major test or experiment equipment that is critical for carrying out the proposed project that is already available or would need to be purchased in order to carry out the proposed investigation. In the latter case, these costs must be entered in the proposal *Budget Summary* and described in the *Budget Details* (see further below).

- *Curriculum Vitae* [Reference: Appendix B.(c)(6)]. The PI must include a *Vitae*, not to exceed three pages, that includes his/her professional background and a bibliography of publications relevant to the proposal. A one page *Vitae* for each Co-I may be included.
- *Current and Pending Support* [Reference: Appendix B.(c)(10)]. Information must be provided for all ongoing and pending projects and proposals that involve the proposing PI and any Co-I's who are expected to perform a major share of the proposed work. In particular, provide the following information:
  - Project Title,
  - Sponsoring agency or institution (including point of contact),
  - Proposed period of performance and budget, and
  - Commitment by PI in terms of Full Time Equivalent (FTE) Work Year,

for each such individual and for each of the two categories of awards, namely,

- A. Current Awards (for any of the period that overlaps with the submitted proposal),  
and
- B. Pending Awards (including the submitted proposal).

In addition, provide the name of any other institution, including the point of contact with telephone number, to which the proposal (or any part thereof) submitted to this NRA has been or will be submitted for consideration of funding. For such pending research, the PI must notify the cognizant Thrust Area Manager identified for this NRA immediately of any proposals that are awarded anytime after the proposal Due Date for this NRA until the time of NASA's selections.

- *Co-I and Collaborator Letter(s) of Commitment*. Every Co-Investigator and/or Collaborator identified as a participant in the proposal's *Technical/Management Section* must submit a brief, signed letter of commitment that acknowledges his/her participation. In the case of more than one Co-I and/or Collaborator, a single, multiply-signed letter is preferred to minimize proposal size. In any case, each letter should be addressed to the PI, may be a facsimile, and is required even if the Co-I or Collaborator is from the PI's own institution. The text of this letter should contain the following, or approximately similar, language:

“I(we) acknowledge that I(we) am(are) identified by name as Co-Investigator(s) [or Collaborator(s)] to the investigation entitled <name of proposal> that is submitted by <name of Principal Investigator> to the NASA Research Announcement <alpha-numeric identifier> and that I(we) intend to carry out all responsibilities identified for me(us) in this proposal.”

- *Budget Summary and Details* [Reference: Appendix B.(c)(8)]. Proposals must contain a *Budget Summary* (format given at end of this Appendix) for each year of the proposed effort filled out in accordance with the following *Instructions for Budget Summary*. The Web site where this NRA is posted also has this form identified for downloading. Note especially the following important considerations:

(i) Attention is directed to discussion of item 2.c. *Equipment* on the *Instructions* sheet regarding the proposed purchase of personal computers and/or commercial software, both of which are considered to be “general purpose equipment.” If a proposal is selected for award, failure to adequately address the provisions of the instructions for item 2.c will require that NASA contact the proposing institution for the required information. Such activity may delay the award until the purchase is either justified as a direct charge for general purpose equipment or is budgeted as an indirect expense.

(ii) If a PI from a non-Government institution proposes to team with a Co-I from a U.S. Government institution (for this purpose, JPL is considered a NASA Center), then the institutional budget for that Government Co-I is to be included in the proposal’s *Budget Details*, and the cost for this Government Co-I is to be listed on line 4, “Other Applicable Costs,” of the *Budget Summary*. If the proposal is selected, NASA will execute an inter- or intra-Agency funds transfer, as appropriate, to cover the cost of the Government Co-I. Conversely, if a Government PI institution teams with a private sector Co-I institution, that Government institution is expected to cover such Co-I costs through a subcontract that they execute. Therefore, such private sector Co-I costs should be entered on line 2.a, “Subcontracts,” on the *Budget Summary*.

(iii) The proposing (PI) institution must subcontract the funding of all proposal Co-I’s who reside at other institutions (except for a Government Co-I for a private sector PI as noted above) unless specifically noted otherwise in the Program Element; that is, NASA will not separately make awards to Co-I’s at distributed institutions regardless of the cost impact to the PI proposal for the management of such subcontracts.

(iv) In addition to the *Budget Summary* and in accordance with the *Instructions for Budget Summary* given in Section C.6 of this Appendix, the proposing institution must append at the end of the proposal sufficient details in narrative format to allow a full understanding of the budget. The proposing institution may also append the proposed budget in the format of their choice without page limit.

(v) By 2000, NASA is expected to be operating on the basis of full cost accounting, including all Civil Service salaries with overhead. In the interim period, proposals involving NASA and JPL employees as either a PI or as a Co-I should use the accounting method authorized at their institutions at the time proposals are due and for the entire proposed period of performance.

(vi) If an Education/Public Outreach (E/PO) proposal is included with the research proposal, the budget numbers from the *E/PO Budget Summary* (see Appendix A.5.1) must be integrated with the corresponding budget categories on the *Budget Summary* for its “parent” Research Proposal given in Section C.6 of this Appendix for the total period of performance, as well as for each individual year of the proposed effort.

- *Reprints/Preprints.* Up to two reprints and/or preprints for peer-reviewed publications that are considered critical to the proposal's understanding and/or background may be appended. Nevertheless, note that reviewers will be asked to base their judgments of the merits of a proposal only on its *Scientific/Technical/Management Section*; therefore, proposers should ensure the self consistency and completeness of that *Section*.

### **C.5 Forms and Certifications**

The following pages contain the required *Budget Summary* form, the *Instructions for Budget Summary*, and, for reference only, copies of the three currently required *Certifications*. A reasonable facsimile of this *Budget Summary* form may be generated by the proposer for submission so long as it contains all the indicated information and lines.

## **BUDGET SUMMARY**

**Includes optional Education/Public Outreach Proposal:        YES        NO**

**For (check one):**

\_\_\_ Total Period of Performance from (M/D/Y) \_\_\_\_\_ to \_\_\_\_\_

\_\_\_ For Year \_\_\_ of \_\_\_ from (M/D/Y) \_\_\_\_\_ to \_\_\_\_\_

		<u><b>  NASA USE ONLY  </b></u>	
	<b>A</b>	<b>B</b>	<b>C</b>
1. <u>Direct Labor</u> (salaries, wages, and fringe benefits)	_____	_____	_____
2. <u>Other Direct Costs:</u>			
a. Subcontracts	_____	_____	_____
b. Consultants	_____	_____	_____
c. Equipment	_____	_____	_____
d. Supplies	_____	_____	_____
e. Travel	_____	_____	_____
f. Other	_____	_____	_____
3. <u>Facilities and Administrative Costs</u>	_____	_____	_____
4. <u>Other Applicable Costs:</u>	_____	_____	_____
5. <u>SUBTOTAL--Estimated Costs</u>	_____	_____	_____
6. <u>Less Proposed Cost Sharing</u> (if any)	_____	_____	_____
7. <u>Carryover Funds</u> (if any)			
a. Anticipated amount : _____			
b. Amount used to reduce budget	_____	_____	_____
8. <u>Total Estimated Costs</u>	_____	_____	XXXXXX
9. <u>APPROVED BUDGET</u>	XXXXXX	XXXXXX	_____

## **INSTRUCTIONS FOR BUDGET SUMMARY**

- Provide a complete Budget Summary (which may include an optional Education/Public Outreach effort) for the total as well as each individual year of the proposed period of performance.
  - Enter the proposed estimated costs in Column A (Columns B & C for NASA use only).
  - Provide, as attachments, detailed computations of all estimates in each cost category with narratives as required to fully explain each proposed cost as follows.
1. Direct Labor (salaries, wages, and fringe benefits): Attachments should list the number and titles of personnel, amounts of time to be devoted to the grant, and rates of pay.
  2. Other Direct Costs:
    - a. Subcontracts: Attachments should describe the work to be subcontracted, estimated amount, recipient (if known), and the reason for subcontracting.
    - b. Consultants: Identify consultants to be used, why they are necessary, the time they will spend on the project, and rates of pay (not to exceed the equivalent of the daily rate for Level IV of the Executive Schedule, exclusive of expenses and indirect costs).
    - c. Equipment: List separately. Explain the need for items costing more than \$5,000. Describe basis for estimated cost. General purpose equipment is not allowable as a direct cost unless specifically approved by the NASA Grant Officer. Any equipment purchase requested to be made as a direct charge under this award must include the equipment description, how it will be used in the conduct of the basic research proposed and why it cannot be purchased with indirect funds.
    - d. Supplies: Provide general categories of needed supplies, the method of acquisition, and the estimated cost.
    - e. Travel: Describe the purpose of the proposed travel in relation to the grant and provide the basis of estimate, including information on destination and number of travelers where known.
    - f. Other: Enter the total of direct costs not covered by 2a through 2e. Attach an itemized list explaining the need for each item and the basis for the estimate.
  3. Facilities and Administrative (F&A) Costs: Identify F&A cost rate(s) and base(s) as approved by the cognizant Federal agency, including the effective period of the rate. Provide the name, address, and telephone number of the Federal agency official having cognizance. If unapproved rates are used, explain why, and include the computational basis for the indirect expense pool and corresponding allocation base for each rate.
  4. Other Applicable Costs: Enter total explaining the need for each item.
  5. Subtotal-Estimated Costs: Enter the sum of items 1 through 4.
  6. Less Proposed Cost Sharing (if any): Enter any amount proposed. If cost sharing is based on specific cost items, identify each item and amount in an attachment.
  7. Carryover Funds (if any): Enter the dollar amount of any funds expected to be available for carryover from the prior budget period. Identify how the funds will be used if they are not used to reduce the budget. NASA officials will decide whether to use all or part of the anticipated carryover to reduce the budget (not applicable to 2nd-year and subsequent-year budgets submitted for award of a multiple year award).
  8. Total Estimated Costs: Enter the total after subtracting items 6 and 7b from item 5.

---

**Certification Regarding Debarment, Suspension, and Other Responsibility Matters**  
**Primary Covered Transactions**

---

This certification is required by the regulations implementing Executive Order 12549, Debarment and Suspension, 34 CFR Part 85, Section 85.510, Participant's responsibilities. The regulations were published as Part VII of the May 26, 1988 Federal Register (pages 19160-19211).

- The prospective primary participant certifies to the best of its knowledge and belief, that it and its principals:
  - Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;
  - Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State, or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;
  - Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (1)(b) of this certification; and
- (i) Have not within three-year period preceding this application/proposal had one or more public transactions (Federal, State, or local) terminated for cause or default.

(2) Where the prospective primary participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

---

### **Certification Regarding Lobbying**

---

- No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.
- If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.
- The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000, and not more than \$100,000 for each such failure.



---

**Certification of Compliance with the NASA Regulations Pursuant to Nondiscrimination in  
Federally Assisted Programs**

---

The (*Institution, corporation, firm, or other organization on whose behalf this assurance is signed, hereinafter called "Applicant "*) hereby agrees that it will comply with Title VI of the Civil Rights Act of 1964 (P.L. 88-352), Title IX of the Education Amendments of 1962 (20 U.S. 1680 et seq.), Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S. 794), and the Age Discrimination Act of 1975 (42 U.S. 16101 et seq.), and all requirements imposed by or pursuant to the Regulation of the National Aeronautics and Space Administration (14 CFR Part 1250) (hereinafter called "NASA") issued pursuant to these laws, to the end that in accordance with these laws and regulations, no person in the United States shall, on the basis of race, color, national origin, sex, handicapped condition, or age be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity for which the Applicant receives federal financial assistance from NASA; and hereby give assurance that it will immediately take any measure necessary to effectuate this agreement.

If any real property or structure thereon is provided or improved with the aid of federal financial assistance extended to the Applicant by NASA, this assurance shall obligate the Applicant, or in the case of any transfer of such property, any transferee, for the period during which the real property or structure is used for a purpose for which the federal financial assistance is extended or for another purpose involving the provision of similar services or benefits. If any personal property is so provided, this assurance shall obligate the Applicant for the period during which the federal financial assistance is extended to it by NASA.

This assurance is given in consideration of and for the purpose of obtaining any and all federal grants, loans, contracts, property, discounts, or other federal financial assistance extended after the date hereof to the Applicant by NASA, including installment payments after such date on account of applications for federal financial assistance which were approved before such date. The Applicant recognized and agrees that such federal financial assistance will be extended in reliance on the representations and agreements made in this assurance, and that the United States shall have the right to seek judicial enforcement of this assurance. This assurance is binding on the Applicant, its successors, transferees, and assignees, and the person or persons whose signatures appear below are authorized to sign on behalf of the Applicant.

NASA FORM 1206